Empirical evidence of the macroeconomic determinants of income inequality for Central and Eastern European countries

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Abstract: Income inequality has become an inevitable topic in every country regardless of its level of economic development. However, the increase of wealth with the outpouring of globalization has put a particular emphasis on the income inequality, especially for countries that were characterized as transition economies. Thus, the purpose of this study is to investigate the economic determinants of income inequality of Central and Eastern European countries (CEEC). The research methodology consists of panel regression analysis based on Least Squares Dummy Variable (LSDV) model. By adding the dummy for each country, we are estimating the pure effect of economic indicators (by controlling for the unobserved heterogeneity) on Gini index. Each dummy is absorbing the effects particular to each country. The dataset covers an unbalanced panel of 18 countries. The empirical results reveal that income inequality of CEE countries primarily depends on main macroeconomic indicators such that GDP per capita, unemployment rate, and inflation as well as general government consumption expenditures, current account balance, real interest rate and the population growth rate.

Keywords: income inequality, economic determinants, LSDV, CEEC

JEL Classification codes: E00, D6, D63

INTRODUCTION

While inequality is rightfully considered an important topic because of its economic and social repercussions, it has not been discussed, let alone studied as much as it should be among the circles of academia, in particular empirical studies lack. Basically, many scholars for long argued that questions of income distribution are poisonous and harmful to sound economics (Lucas 2004; Feldstein 1998). However, recently there has been an increase in interest on the research related to income inequality and its effects especially after the Global Financial Crisis of 2008. Those who have done research on income inequality such as Milanovic (2016) and Stiglitz (2012) view it as a major social ill that needs urgent address by policy makers, including governments and international organizations.

Central and Eastern European countries (CEEC)[1] have experienced major transformations in their ways of functioning in the last three decades and most of them are already members of the European Union. At the very beginning of the transition, they opened the doors to market economy and economic globalization as well as embracing democracy as a political force (Leitner and Stehrer, 2009). However, this path has not been so smooth, and it have been marked by various changes and fluctuations in the labor market, market efficiency, prices, and other factors. Nevertheless, CEEC opened to global trade and became increasingly export-oriented economies, experiencing noticeable profits from it, extending the role of private sector in the economy, dismounting the regulations that stiff the business development and by that matter, building institutions that support the newly created market systems (Estrin and Uvalic 2013). During that period some transition countries have been characterized by a sharp rise in income inequality, whereas Czech Republic, Hungary and Poland experienced more modest increases compare to others (Flemming and Micklewright, 1999). Thus, studying income inequality in CEEC and determinants that influence its rise or fall is important particularly because of the effect that income inequality has on these countries' economies. As seen in several contexts, income inequality has more severe effects on economic growth and development, especially in the transitioning economies and developing countries, because countries that are not still EU member states suffer from scrawny economies and increasing poverty rates. Income inequalities only exacerbate the economic development, stalling the progress and increasing inefficiencies and productivities within these countries.

Regarding the global income inequality, it has been on the rise until a period, as it witnessed first a plateau, and then a slight downward tendency mostly because of the economic progress made by China and India. Regardless of this decline, global inequality remains high, especially regarding within-country inequality (Cingano, 2014). Over the last six decades as income inequality has continuously risen, people's lifestyles have also changed. Technology has made transportation more cost-effective and has improved and advanced automation and communication considerably. These technological changes have been the driving force behind the opening of new markets within countries and across countries, providing chances for growth in wealthy and poor countries alike. As these changes have lifted multitudes of people out of poverty, income inequality has risen, reflecting changes in growth and its distribution effects.

1 LITERATURE REVIEW

It is well known that the income inequality is affected by political, social, and economic factors. An important factor is flexibility of labor market signifying that labor and workers' rights are continuously undermined, and the legislation passed by the politicians in power increasingly follows the rules and the desires set by the wealthy employers and owners of the job market. Fraser Institute (FI) compares the indexes of labor market regulations across many countries. The value of index ranges from 1 to 10, where 1 represents a strongly regulated labor market and 10 represents a reasonably flexible labor market. A striking fact that appears is that the index increased in the most of CEE countries, reaching an average value of 7.5 in 2020, which ultimately means that their labor legislation is much more favorable than in the first decade of transition. From this viewpoint, this would lead to potentially lower income inequality (Tjong and Schmillen, 2019).

In addition to flexibility of the labor market, there is also a dismantling and decreasing power of trade unions. As Frederiksen and Poulsen (2010) and Wilkinson and Pickett (2010) argue in

[1] CEE comprises of 18 countries, namely, Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kosovo, Latvia, Lithuania, Moldova, North Macedonia, Poland, Romania, Serbia, Slovak Republic, Slovenia, Ukraine.

their studies, a decline in trade and labor union power also means a decline in wage bargaining, and an increase in income inequality.

Another factor that increases the income inequality is the tax reform – the existence of flat taxation in the most of CEE countries only increases the chances of unequal income distribution. Corporations and companies are subject to a flat corporate tax. As extensive studies show the effects of progressive taxation in the equalization of income distribution, many CEE countries still use flat taxation. This type of taxation completely favors the rich, thus contributing to the widening gap between the rich and the poor and putting a heavier burden on the lower-income household.

According to Milanovic (2016) study, economic reform is heavily related negatively to the bottom 10 percent income shares, and positively with the income shares of the top 10 and 20 percent. Therefore, while social and economic reforms undertaken by many of the countries might spur economic growth within states, it is rather ambiguous who the benefiters of those reforms are.

The research conducted on FDI and its effects on income inequality are diverse. While it is impossible to summarize all that has been concluded, it is worth mentioning its effects on economic growth. FDI is prized and sought after because of its ability to channel technological spillover to a country's economy through forward and backward linkages. This technological progress is important because, it contributes, along with other factors to economic growth. Economic growth is an important aspect of income inequality, as has been maintained by many such as Milanovic (2016) or Kuznets (1955). However, if investment policies are not adequately oriented, as such is the case with the countries on many occasions, it may lead to "technology less" growth, and the benefits of the investment may accrue to foreign investors only, while the host country provides the cheap labor and other benefits.

Studies also show that there is a positive correlation between FDI and income inequality, and the FDI effect on income inequality is particularly present in the first years after transition. In CEE countries, FDI is highly prized for economic development and growth, although its effects are mixed (Carkovic & Levine 2002; Blomstrom & Kokko 2003). To attract inward foreign investment, the countries offer various privileges such as tax exemption and financial support and subsidies to the MNCs, which put foreign investors in more favorable standing than domestic investors. Mencinger (2012) argues that this process is a substitution of muddy privatization during the transition and offers a new way of selling the assets to foreigners, who are allowed a substantial market share dominance, usually in telecommunications, banking, and electricity. This does not allow for local economies to develop.

The consensus among many studies is that in transitioning economies privatization caused an increase in income inequality. The reasons vary and include the redistribution of assets, rent-seeking behavior (Stiglitz 2012) and non-wage income creation based on entrepreneurship. Whereas the explanations differ, the results are consistently similar. In a cross-sectional time-series analysis done by Bandelj and Mahutga (2010), a substantial positive correlation was found between income inequality as represented by the Gini coefficient, and privatization as represented by the size of the private sector of the economy. The study, while also including FDI inflows, showed that countries which preferred inward foreign direct investment to domestic investment, showed greater evidence of the increase in income inequality levels.

In this regard, these factors all affect many economic indicators that play a crucial role in the income inequality levels, including here GDP, GNP, inflation, or unemployment. Generally, GDP per capita is representative of the state of an economy, as higher GDP is commonly equated to higher standards of living. There are several aspects on the validity of GDP as a proper measurement of the health and strength of an economy, such as its inability to capture unpaid household work or counting economic activities that are damaging to the climate as contributing to economic growth. The assumption is that economic growth, represented by

these two indicators, may have a negative impact on income inequality for the fact that it is often associated with higher investment rates which generate higher employment levels, offering greater access to income generating activities and jobs to larger numbers of people. This consequently may lift all boats up, meaning increase incomes on all income percentiles and therefore reduce income inequality. As several studies including Causa et al. (2014) show, growth enhancing reforms in OECD countries contributed to lowering income inequality levels by delivering higher income gains for households at the bottom of the distribution. Another study conducted by Luan and Zhou (2017) concluded that higher GDP per capita leads to a decrease in the Gini coefficient, answering the question of whether economic development lowers income inequality. The growth enhancing reforms that lead to better income inequality outcomes include higher minimum wage, reduction of regulatory barriers to domestic competition, properly designed inward investment policies, better access to financial capital for lower percentiles of income distribution, better social welfare and so on.

2 RESEARCH METHODOLOGY

The methodology of this study consists of a panel regression model such as the least square dummy variable model (LSDV). By adding the dummy for each country, we are estimating the pure effect of industry growth (by controlling for the unobserved heterogeneity). Each dummy is absorbing the effects particular to each country. This method was chosen due to the missing data for Gini index for some years in some countries. Thus, because of that, we were not able to use a dynamic panel regression model.

The panel data has two dimensions, one as an individual index *(i)*, concretely the country *(i)*, and the other dimension is time *(t)*. The regression equation of the fixed effects regression model is:

$y_{it} = \alpha + \beta' X_{it} + u_{it}$, where $\quad i = 1, \dots, N, \quad t = 1, \dots, T$

However, this regression equation does not fulfil the conditions of Gauss-Markov theorem, as $Eu_{it} = \mu_i \neq 0$. OLS may be biased, inconsistent, and even if it is unbiased, it is usually inefficient (Kunst, 2010). For this reason, we proceed the analysis by applying the LSDV (Least-Squares Dummy Variables).

Let $Z_{\mu,it}^{(j)}$ denote a dummy variable that is 0 for all observations *it* with $i \neq j$ and 1 for $i = j$. Then, assembling $Z_{\mu,it} = \left(Z_{\mu,it}^{(1)}, \dots, Z_{\mu,it}^{(N)}\right)'$ and $\mu = (\mu_1, \dots, \mu_N)'$, the regression model

$y_{it} = \alpha + \beta' X_{it} + \mu' Z_{\mu,it+} v_{it}$, $\quad i = 1, \dots, N, \quad t = 1, \dots, T,$

fulfils all conditions of the Gauss-Markov Theorem. OLS for this regression is called LSDV (Least-Squares Dummy Variables), the within, or the Fixed Effects estimator. Assuming that X is non-stochastic, LSDV is unbiased, consistent, and linear efficient (Kunst, 2010).

The equation of the specified model for the fixed effects model becomes:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \cdots + \beta_k X_{k,it} + \gamma_2 E_2 + \cdots + \gamma_n E_n + u_{it}$$

Where Y_{it} is the dependent variable, in this case Gini index, where with i is denoted the country and with t the time. $X_{1,it}$ represents the independent variables (described in Table 1 below), in this case the potential determinants of income inequality. E_n is the country n. Since they

are binary (dummies) we have $n-1$ entities included in the model. γ_n is the coefficient for the binary repressors (countries). u_{it} is the error term.

2.1 Data Description

The dataset covers an unbalanced panel of 18 CEE countries over the period 2003-2020 and the same are provided from the database of World Development Indicators – World Bank. The lack of data for GINI index before the year 2003 for this set of countries, limit the sample from 2003 to 2020. Even the last data is for the year 2020 for some countries, whereas for others 2019 and not afterwards. To prevent the loss of degrees of freedom because of those missing data, the moving average method (with factor 2) was used to supplement some of those missing observations, mostly for Gini index. This is one of the statistical techniques available for tackling issues with missing data, which is simple to apply, yet most suitable for this case.

Many economic variables are used in the models as control variables i.e., potential macroeconomic determinants of income inequality. These variables represent different factors related to the real sector, international trade, international integration, macro-financial stability, economic activity, and investment, as well as the government intervention.
The selection of the potential determinants is done by contemplating the most important macroeconomic indicators, and partially considering the empirical literature in the area. In its early phase, the analysis covered more than 15 control variables that potentially affect the income inequality, however, due to various reasons (missing data, or statistical insignificance), they were narrowed down to the following 12, presented in Table 1.

Table 1: Description of variables

Control variables	Indicator	Proxy indicator
Gini	Gini index	Income Inequality
GDP_pc	GDP per capita (constant 2010 US$), t-1	Economic development
Unemp	Unemployment rate	
Inf	Inflation rate	
Cab	Current account balance (% of GDP)	International integration
Trade	Trade (% of GDP)	
Money	Broad money (% of GDP)	Financial stability
Rir	Real interest rate (%)	
FDI	Foreign Direct Investment, net inflows (% of GDP)	Investment
Gfcf	Gross fixed capital formation (% of GDP)	
Savings	Gross domestic savings (% of GDP)	Credit base

Gov_exp	General government final consumption expenditure (% of GDP)	Government intervention
Pop	Population growth rate	Population

The following Table 2 represents the descriptive statistics of the used variables in the empirical research.

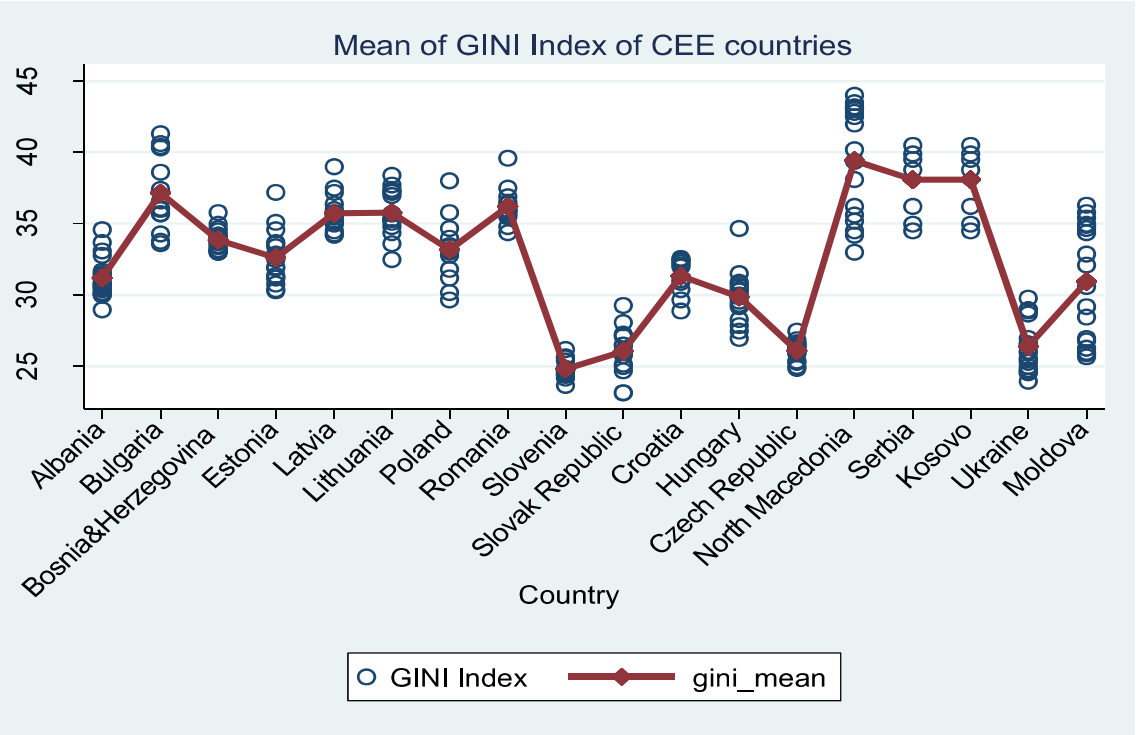
Table 2: Descriptive Statistics

Variable	Observation	Mean	St.Deviation	Min	Max
Gini	277	32.1768	4.8419	23.2	44
GDP_pc	354	9619.581	5840.439	1537.17	24744.84
Unemp	357	12.7934	9.2562	2.01	55
Inf	353	4.6275	5.3321	-9.6537	38.8816
Cab	349	-4.248908	5.5731	-25.74	10.2811
Trade	354	109.7159	31.4970	53.7102	189.804
Money	241	55.2410	15.9930	17.3587	94.2495
Rir	249	4.178772	5.0804	-13.5805	19.0926
FDI	349	5.4348	8.8920	-40.0866	106.6026
Gfcf	351	23.6114	4.7173	12.4354	38.0702
Savings	349	20.6339	5.1987	3.6798	32.7159
Gov_exp	354	18.1041	2.9085	10.1252	24.1865
Pop	360	-0.3918	0.6096	-3.7423	0.9038

Source: Author's calculations

In the Graph 1 is displayed the mean of Gini index as a measure of income inequality of CEEC for the period 2003-2020, observing for the country's heterogeneity. Based on the results in the graph, one can conclude that the countries with lower income inequality from this set of countries are Slovenia, Czech Republic, and Slovak Republic, followed by Ukraine, Croatia, Hungary, and Moldova, while the countries with higher income inequality are North Macedonia, Serbia, and Kosovo, whereas the other countries are in the middle of the pack. Most CEE countries have marked a decline in income inequality based on the last data. Trade openness and neoliberalism in general suggest that with growth, income distribution would also even out eventually, and so data shows that this holds for these countries.

Graph 1. Mean of Gini Index of CEE countries for the period 2003-2020



Source: Author's calculations

3 RESULTS AND DISCUSSION

From the obtained results of the model estimation, presented in the following Table 3, we can see that the unrestricted Model 1 for GINI index is statistically significant (F-statistics=44.42, with p-value=0) and it is well fitted (R-squared coefficient=0.8747 and Adjusted R-squared coefficient=0.8550). However, one can note that there are several insignificant variables in the unrestricted model, or variables whose coefficients have p-values greater than 0.05. Therefore, these variables are gradually excluded from the model, meaning that their coefficients are restricted to be equal to 0. After exclusion of those redundant variables, the overall statistical significance and model fit have not significantly changed. The F-statistics in the restricted Model 2 is 57.32, whereas the adjusted R-squared coefficient is 0.8545. According to the restricted (final) model, Gini index in the CEE countries primarily depends on factors related to economic development, general government consumption expenditures, current account balance, real interest rate, and the population. The coefficient of GDP per capita is negative and statistically significant, meaning that the increase of GDP per capita decreases the income inequality. Also, the findings of Causa et al. (2014) reveal that several growth-enhancing reforms contributed to contracted inequality by delivering stronger income gains for households at the bottom of the distribution compared with the average household, whereas Rubin and Segal (2015) find a positive relationship between growth and income inequality. Although countries of CEE show an increase in economic growth and income per capita over time, they would still experience Kuznets curve, which indicates that countries at the beginning of their growth will experience a high-income inequality, which should then be followed by a decline in it, as the economic growth starts to even out. Nevertheless, many of the countries have faced sustained lack of growth due to several factors. As growth is a prerequisite for improved standards of living, and decreasing inequality, according to Kuznets

(1955), there is a need to review determinants that contribute to the increasing income inequalities for the most of CEE countries. These include political instability, populism, poor educational indicators, and corruption.

The unemployment rate is positively related with Gini index, that means, for one unit increase of the unemployment rate, the income inequality increases by 0.15 units, holding the other factors unchanged. Sheng (2011) also finds a positive correlation between unemployment and income inequality. Inflation rate also increases the income inequality as its coefficient is positive and statistically significant. This result is in line with findings of Nantob (2015) that finds that higher inflation is associated with higher income inequality. Whereby general government consumption expenditures have significant negative impact, implying that the increase of government expenditures decreases the income inequality. Likewise, the findings of Sidek (2021) advocate that government expenditure shrink income inequality and results from developed countries support the inverted U-shaped Kuznet curve where higher government expenditure initially led to more inequality but would eventually bring about a positive effect after a certain threshold level. The real interest rate is positively related with Gini index, suggesting that the increase of real interest rate increases the income inequality. Similarly, Bozik (2019) finds that increase in the real interest rate leads to increase in income distribution and thus worsens income distribution in developed countries. Furthermore, the population growth rate is also positively correlated with Gini index, whereas current account balance has significant negative impact, with estimated coefficient of around 0.14. Broad money, gross fixed capital formation, FDI, savings and trade do not show any statistical significance for this sample of data. The relationships between Gini index and the estimated determinants can be further confirmed by the OLS plot and fitted lines for GDP per capita, unemployment rate, government expenditures, real interest rate, and current account balance displayed in Graph 2, respectively.

Table 3. Panel regression results based on LSDV method

DV: Gini index	Model 1		Model 2	
Variable	Coeff.	Prob.	Coeff.	Prob.
GDP_pcg	-1.2627	0.000	-1.2218	0.000
Unemp	0.1340	0.074	0.1463	0.016
Inf	0.2111	0.005	0.1460	0.021
Gov_exp	-0.5751	0.000	-0.6275	0.000
Cab	-0.2089	0.018	-0.1392	0.000
Rir	0.1830	0.019	0.1162	0.079
Pop	1.0007	0.026	1.0444	0.014
FDI	0.0093	0.576	-0.1992	0.132
Money	0.0314	0.261	-	-
Gfcf	0.0415	0.631	-	-
Savings	-0.1149	0.238	-	-
Trade	0.0145	0.378	-	-
Observations	316		316	
R-squared	0.8747		0.8697	

Adjusted R-squared	0.8550	0.8545
F-statistic	44.42	57.32
Prob(F-statistic)	0.0000	0.0000

Source: Author's calculation

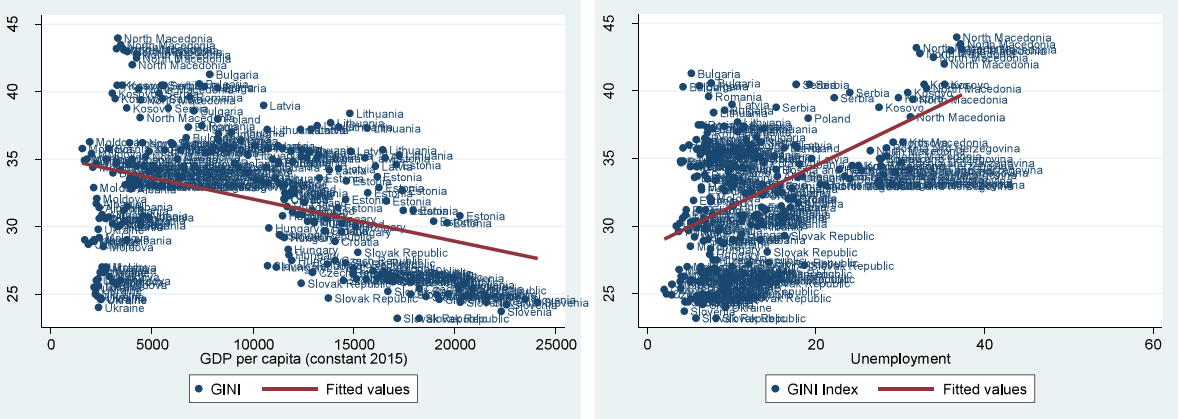
The fixed effects for each country are presented in Table 4. The effects of independent variables, i.e., determinants are mediated by the differences across countries. By adding the dummy for each country, we are estimating the pure effect of independent variables (by controlling for the unobserved heterogeneity). Each dummy is absorbing the effects particular to each country. In the LSDV model we obtain a comon intercept and n-1 binary regressors, meaning that the first country's fixed effects are omitted in the estimation procedure. The source of binary regressors come from the unobserved variable *Zi* that varies across states but not over time.

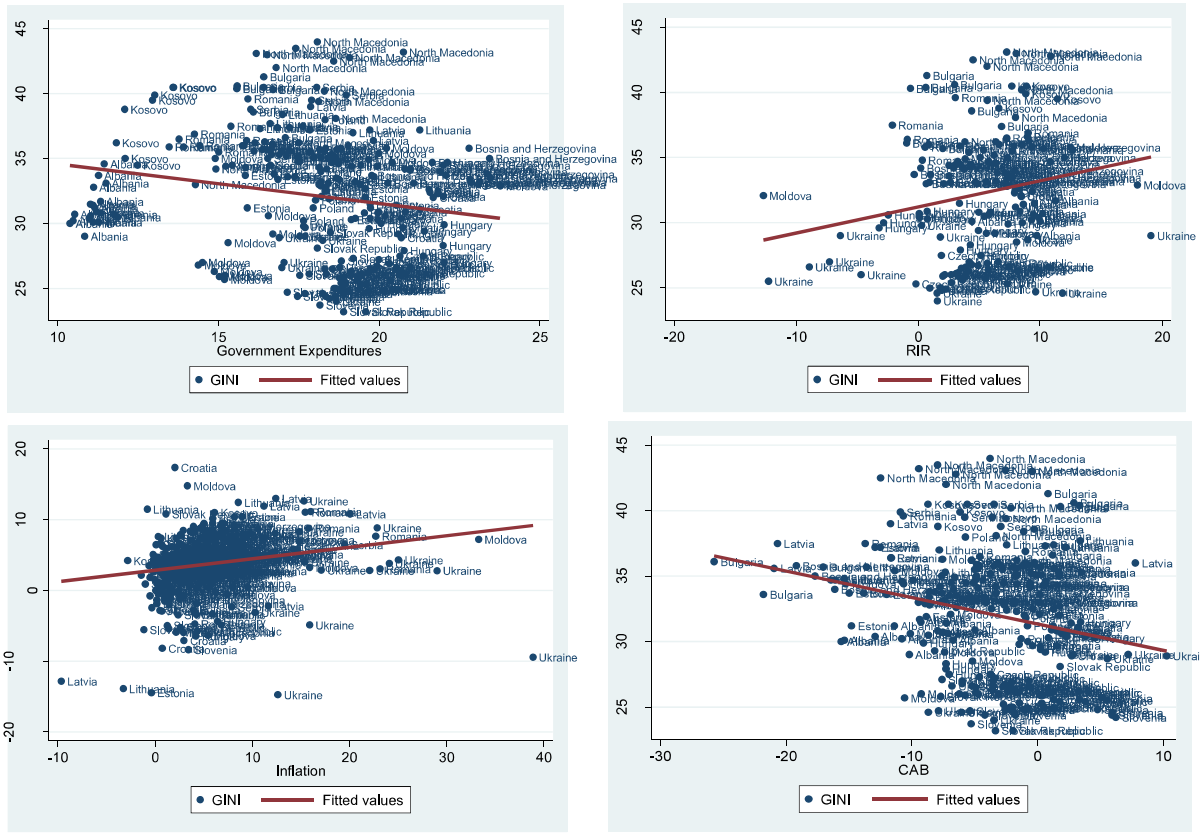
Table 4. The coefficients for the binary repressors (countries)

Country	Coefficient	Country	Coefficient	Country	Coefficient
Albania	-	Estonia	-4.680837***	Czech R.	5.649321**
Bulgaria	-3.997842**	Latvia	-9.520323***	Slovak R.	3.772147**
Bosnia &Herzegovina	3.166157**	Lithuania	-5.261228**	Slovenia	-2.995342**
Kosovo	-8.536128*	Romania	5.116453***	Hungary	1.710807
North Macedonia	4.448402**	Moldova	-10.51749***	Poland	-6.774403**
Serbia	-11.62192**	Ukraine	7.242513**	Croatia	-3.653973*

* ; **; and *** represent the rejection of null hypothesis in the level of significance of 10%; 5%; and 1%, respectively.
Source: Author's calculations

Graph 2 OLS plot of the Macroeconomic Determinants of Income Inequality in CEE countries





Source: Author's calculations

4 LIMITATIONS OF THE STUDY

The methodological approach, as elaborated above, has two major limitations. Namely, missing data, primarily for Gini index, leads to significant decrease in the sample size, thus losing valuable degrees of freedom. Also, missing data for some finance variables, such as non-performing loans and capital adequacy ratio, significantly narrow the analysis, which can cause omission of relevant variables from the models. Also, other factors, such as political and social are not considered, but the analysis primarily focuses on macroeconomic factors.

CONCLUSION

In CEE countries based on the data from various sources, it can be argued that since the late 1990s and on, when neoliberal ideology and economic globalization were introduced, and economic transition started, income inequality has been on the rise. The levels of income inequalities differ between countries, as do the factors that contributed specifically to the rise of income inequality in each country, but the consequences are similar in all the countries of Central and Eastern Europe.

The empirical analysis of this study reveals that income inequality in this set of countries primarily depends on factors related to economic development, GDP per capita, unemployment, inflation, general government consumption expenditures, current account balance, real interest rate and population. This analysis focuses on macroeconomic determinants, whereas political, social, and other factors are subject of further research.

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